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Fraternal Birth Order and Sexual Orientation in Pedophiles

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Whether homosexual pedophiles have more older brothers (a higher fraternal birth order) than do heterosexual pedophiles was investigated. Subjects were 260 sex offenders (against children age 14 or younger) and 260 matched volunteer controls. The subject's relative attraction to male and female children was assessed by phallometric testing in one analysis, and by his offense history in another. Both methods showed that fraternal birth order correlates with homosexuality in pedophiles, just as it does in men attracted to physically mature partners. Results suggest that fraternal birth order (or the underlying variable it represents) may prove the first identified universal factor in homosexual development. Results also argue against a previous explanation of the high prevalence of homosexuality in pedophiles (25% in this study), namely, that the factors that determine sexual preference in pedophiles are different from those that determine sexual preference in men attracted to adults. An alternative explanation in terms of canalization of development is suggested.

KEY WORDS: birth order; canalization; homosexuality; pedophilia; phallometry; sexual orientation; sibling sex ratio.

INTRODUCTION

Studies of American, British, Canadian, and Dutch subjects have repeatedly shown that birth order correlates with sexual orientation in men (Blanchard, 1997);

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homosexual men have a higher mean birth order (i.e., more older siblings) than comparable heterosexuals. It has further been shown that homosexual men have a higher birth order than heterosexual men primarily because they have a greater number of older brothers. They do not differ with regard to older sisters, once their number of older brothers has been taken into account (Blanchard and Bogaert, 1996a,b; Blanchard *et al.*, 1998; Jones and Blanchard, 1998). This means that the probability a man will be homosexual increases only in proportion to his number of older brothers; older sisters neither increase nor decrease the probability of homosexuality in later-born males. This phenomenon has therefore been termed the *fraternal birth order effect*.

Virtually all this research has been carried out on men who are sexually attracted to physically mature partners. Only two studies have investigated whether sexual orientation also correlates with fraternal birth order in pedophiles. One study found that homosexual pedophiles do have a higher fraternal birth order (more older brothers) than heterosexual pedophiles (Bogaert *et al.*, 1997); the other failed to confirm this difference for men with sexual offenses against prepubescent boys or girls, but did confirm it for men with offenses against pubescent boys or girls (Blanchard and Bogaert, 1998).

The relation of fraternal birth order to sexual orientation among pedophiles is relevant to theories of pedophilia and of homosexuality. The best epidemiological evidence indicates that only 2–4% of men attracted to adults prefer men (ACSF Investigators, 1992; Billy *et al.*, 1993; Fay *et al.*, 1989; Johnson *et al.*, 1992); in contrast, around 25–40% of men attracted to children prefer boys (Blanchard *et al.*, 1999; Gebhard *et al.*, 1965; Mohr *et al.*, 1964). Thus, the rate of homosexual attraction is 6–20 times higher among pedophiles. One explanation of this discrepancy is that the factors that determine sexual preference in pedophiles are different from those that determine sexual preference in men attracted to adults (Freund *et al.*, 1984). A confirmed finding that fraternal birth order correlates with sexual preference in both groups would indicate that this explanation is incorrect or, at best, incomplete. Other hypotheses would have to be explored—for example, the possibility that the same factors increase the probability of homosexuality in men attracted to adults and men attracted to children, but they have a greater impact on the latter.

The correlation of fraternal birth order and sexual orientation in pedophiles is equally relevant to theories of homosexual development. No common feature has yet been identified in the family demographics or developmental histories of all types of homosexual men. The best established predictor of adult homosexuality—cross-gender behavior in childhood (Bailey and Zucker, 1995)—does not appear to characterize homosexual pedophiles (Freund and Blanchard, 1987; Freund *et al.*, 1982), although there is some evidence this group may be less masculine in boyhood without being more feminine (Freund and Blanchard, 1987). A finding that high mean fraternal birth orders characterize men attracted to boys as well as those

attracted to other men—homosexual groups who differ as widely as possible in their own characteristics and in the characteristics of their desired partners—would suggest that fraternal birth order (or the underlying variable it reflects) may be the first universal factor in homosexual development to be identified.

The inconsistency of the prior findings concerning the correlation of fraternal birth order and sexual orientation in pedophiles may relate to methodologic problems in the two relevant studies. The first of these was a retrospective study of sex offenders, which included only those subjects whose clinical charts happened to contain birth order data (Bogaert *et al.*, 1997). It is therefore possible that some selection bias affected its results. The second was a reanalysis of archived data from a classic, large-scale study of sexual offenders (Blanchard and Bogaert, 1998). The recoverable information regarding the subjects' offense histories was minimal, and it is possible that the sexual preferences of the pedophiles in that study were not accurately classified from the available information.

Our study was therefore undertaken to settle the empirical question. This is the first study in which data were collected with the express purpose of examining the relation of fraternal birth order to sexual orientation in a consecutive series of pedophiles. It was also the first to examine directly the relation between pedophiles' fraternal birth orders and their penile responses to laboratory stimuli depicting male and female adults and children.

METHOD

Subjects

There were two sources of pedophilic patients: Male outpatients referred to the Kurt Freund Phallometric Laboratory of the Centre for Addiction and Mental Health—Clarke Division (Toronto, Ontario) for psychophysiological assessment of their erotic preferences, and incarcerated male sex offenders undergoing assessment or treatment at the Sexual Behaviour Clinic of Warkworth Institution (Campbellford, Ontario). A patient was selected for the present study if he met one or more of the following inclusion criteria: (a) He had one or more charges, convictions, or credible accusations of sexual interaction with boys or girls age 14 or under; (b) he had one or more self-reported instances of sexual interaction with boys or girls age 14 or under; or (c) he verbally acknowledged that boys or girls age 14 or under are more sexually interesting to him than men or women aged 17 or over. In the foregoing criteria, *sexual interaction* included noncontact offenses (primarily exposing) as well as offenses involving physical touching.

An otherwise eligible patient was eliminated from the study if he met either of the following exclusion criteria: (a) He had any incest offenses, defined as offenses against biological children, stepchildren, or children living in the same household

toward whom he acted as a father; or (b) he had any offenses against males or females age 15 or over. Two further exclusion criteria disqualified any subject from the study, patient or control: (a) The subject was a twin, or (b) the subject was not sure that he knew of all children born to his biological mother.

Of the 260 pedophilic subjects selected according to the foregoing criteria, 245 came from the Toronto site and 15 from the Campbellford site. All subjects were examined from 1995 through 1998. Two of the 245 Toronto subjects had been assessed at the Kurt Freund Phallometric Laboratory 10 and 16 years before, respectively, and data from their earlier assessments had been included in the study by Bogaert *et al.* (1997).

There were 14 patients who complained of erotic attraction to children (the third inclusion criterion) but stated that they had never acted on their feelings. The number and ages of the children involved in the offenses of the remainder are inexact quantities, partly because these occasionally had to be estimated (if, for example, a man exposed himself to a group of schoolchildren), and partly because some patients undoubtedly concealed offenses for which they were never apprehended. The 246 patients with known offenses involved a total number of 913 children, for a mean of 3.71 children per patient ($SD = 10.50$). Children <6 years old accounted for 12% of the total, children 6–11 years old accounted for 69%, and children 12–14 years old accounted for 19%.

Control subjects were drawn from a pool of 663 men that included subjects who had participated in an earlier study (Blanchard and Bogaert, 1996b) and additional subjects who were recruited and examined in an identical manner to augment that pool. These subjects were paid $10 (Canadian) for completing a self-administered, anonymous questionnaire concerning their family background and other personal information. They were recruited through clubs for promoting business contacts, particular charities, or social events for specific communities and similar organizations; and through advertisements, posted on two university campuses, for heterosexual research subjects. Subjects recruited at club meetings or organized community events were solicited with the understanding that payment would be made to designated charities on their behalf; those recruited as individuals were paid for their participation directly. All subjects indicated, in response to a sexual-orientation item on the questionnaire, that they were heterosexual. It is reasonable to assume, on purely statistical grounds, that virtually 100% of them were gynephilic (i.e., most interested sexually in physically mature females), and they are so labeled in this article. An elaborate matching procedure, which is described later, was used to select 260 men from this pool. Of those selected, 162 had been in the earlier study and 98 had not.

The matching procedure ensured that the mean age of the controls, 33.97 years ($SD = 12.83$), was very close to that of the pedophilic patients, 34.73 years ($SD = 14.20$). It was not feasible to match subjects on education, however, and the groups did differ in this regard. Education was coded on an 8-point ordinal scale. The

median pedophilic patient had some high school education, but without graduation; the median control subject had either completed or was currently enrolled in a bachelor's program. The educational difference between patients and controls was significant [Mann–Whitney $U(N = 520) = 8541.00,\ p < .001$]. This statistical test was two-tailed, as were all others reported in this article unless otherwise specified. The groups did not differ significantly in ethnic origin: 87% of the patients and 93% of the control subjects described themselves as White.

Materials and Procedure

Historical and Demographic Data

Information on a pedophilic patient's history of sexual offenses came primarily from objective documents on his chart; for example, reports from probation and parole officers. These offenses were recorded on a standardized protocol form, as were any additional offenses that he might admit. This form was also used to record the patient's subjective self-report regarding the age and sex of persons who most interest him sexually. For those procedures in which patients were selected or classified on the basis of their sexual offenses, this was done on the basis of all available information regarding their history of sexual offenses, not just on the basis of their latest offense or some otherwise determined index offense. In such procedures, patients with no sexual offenses were selected or classified according to their self-report instead.

Information concerning personal demographics (e.g., a man's age, educational level, ethnic origin) and family demographics (e.g., the ages of the man's parents at the time of his birth, the sequence of boys and girls in his sibship) was collected from both patients and controls by means of a self-administered questionnaire. Only children born to the subject's biological mother were recorded; that is, maternal half-siblings were recorded but paternal half-siblings were not. There were both theoretical and methodologic reasons for this: (1) maternal half-siblings—like full siblings—develop in the same uterus as the subject, whereas paternal half-siblings do not; (2) maternal half-siblings are more likely than paternal half-siblings to be reared in the same home as the subject; and (3) a subject is more likely to know of all children carried by his mother than he is to know of all children sired by his father. In this study, maternal half-siblings were counted the same as full siblings.

Phallometric Measures

For the pedophilic patients at the Toronto site, phallometric testing was used to assess the subject's attraction to male versus female prepubescent children,

male versus female pubescent children, and male versus female adults. In the phallometric test procedure, penile blood volume, the dependent measure of erotic arousal, is monitored during the presentation of potentially erotic test stimuli. The test used in this study is a modification of one described in detail elsewhere (Freund and Blanchard, 1989). The stimuli are audiotaped narratives presented through headphones and accompanied by slides. There are seven categories of narratives, which describe sexual interactions with prepubescent girls, pubescent girls, adult women, prepubescent boys, pubescent boys, and adult men, and also solitary, nonsexual activities ("neutral" stimuli). All narratives are written in the second person and present tense (e.g., "You are babysitting your neighbors' little girl for the evening") and are approximately 100 words long. The narratives describing heterosexual interactions are recorded with a woman's voice, and those describing homosexual interactions, with a man's. Neutral stimuli are recorded with both.

Each test trial consists of one narrative, accompanied by photographic slides showing the front view, rear view, and genital region of a nude model corresponding in age and sex to the topic of the narrative. Neutral narratives are accompanied by slides of landscapes. The full test consists of four blocks of seven trials, with each block including one trial of each type in fixed pseudorandom order. The length of each trial is 54 sec; however, the interval between trials varies because penile blood volume must return to its baseline (flaccid) value before a new trial is started. The time required to complete a test is usually about 1 hr.

Penile blood volume change is sampled four times per second throughout a trial. The subject's response is quantified in two ways: as the extremum of the curve of blood volume change (i.e., the greatest departure from initial value occurring during the 54 sec of the trial), and as the area under the curve. To identify subjects whose penile blood volume changes might reflect random physiological variation rather than erotic arousal, the mean of the three highest positive extremum scores—a quantity called the *Output Index* (Freund, 1967)—is calculated. The phallometric data of subjects who fail to meet the criterion output index of 1.0 ml are excluded.

Each subject's 28 extremum scores are then converted into standard scores, based only on his own extremum data, and the same operation is carried out on his area scores. Next, for each subject, the standardized extremum and area scores are combined to yield a separate composite score for each of the 28 trials, using the formula, $(z_i^{\mathrm{E}} + z_i^{\mathrm{A}})/2$, where z_i^{E} is the standardized extremum score for the ith trial, and z_i^{A} is the standardized area score for the ith trial. These operations are carried out for the following reasons: (a) In phallometric work, some transformation of raw scores is generally required in combining data from different subjects, because the between-subjects variability in absolute magnitude of blood volume changes can otherwise obscure even quite reliable statistical effects. There are numerous sources of such variability; for example, the subject's age, his state of health, the size of his penis, and the amount of time since his last ejaculation from masturbation or interpersonal sexual activity. Empirical research has shown the z-score transformation to be satisfactory (Harris *et al.*, 1992; Langevin, 1985).

(b) The (highly correlated) area and extremum *z*-scores are averaged to obtain a composite that reflects both the speed and amplitude of response and lessens the impact of anomalous responses; that is, large change from initial value but small area or vice versa (Freund *et al.*, 1983).

In the last stage of basic processing, the data are reduced to seven final scores for each subject by averaging his four composite scores in each of the seven stimulus categories. These seven *category scores* are taken as measures of the subject's relative erotic interest in adult women, pubescent girls, prepubescent girls, and so on.

For the present study, the previously mentioned category scores were used to compute three special measures of sexual orientation. A *Pedophilic Sex-Preference Index* was calculated as the subject's category score for prepubescent boys minus his category score for prepubescent girls, and a *Hebephilic Sex-Preference Index* was similarly calculated as the subject's category score for pubescent boys minus his category score for pubescent girls. Finally, a *Teleiophilic Sex-Preference Index* (Greek *téleios*, "full-grown") was calculated as the subject's category score for adult men minus his category score for adult women.

It should be noted that many pedophilic subjects can and do control their reactions during phallometric testing in order to produce a more "normal" response profile (e.g., Freund and Blanchard, 1989). This is primarily accomplished by suppressing responses to pubescent and prepubescent stimulus categories. There was no reason to expect, however, that such attempts at test manipulation might produce spurious positive correlations between the subject's number of older brothers and his scores on the Pedophilic or Hebephilic Sex-Preference indices. On the contrary, the most likely result of such efforts would be to diminish the apparent size of true positive correlations.

Consent

All of the patients and the supplemental volunteer subjects signed consent forms giving permission for their data to be used for research purposes. Control subjects for the earlier study (Blanchard and Bogaert, 1996b) had instead been given an information sheet that stated that the purpose of the study was to examine the relation between people's family backgrounds and their later sexual orientation as adults. That alternative procedure had been approved by the University of Toronto Human Subjects Review Committee, which also examined and approved the information sheet.

RESULTS

The previously described version of the phallometric test was administered to 214 of the Toronto patients. The data of 18 were discarded because of technical

Table I. Linear Regressions of the Three Sex-Preference Indices on the Subject's Number of Older Brothers, Older Sisters, Younger Brothers, and Younger Sisters

	Sex-preference indices (criteria)					
	Pedophilic		Hebephilic		Teleiophilic	
Sibling-type (predictors)	β	p	β	p	β	p
Older brothers	.26	.001	.15	.07	.20	.01
Older sisters	−.06	.47	−.04	.64	−.11	.17
Younger brothers	.01	.93	−.02	.78	.03	.72
Younger sisters	.09	.25	.12	.12	.03	.70

problems (e.g., the patient was too obese to get the volumetric apparatus properly seated) or gross uncooperativeness from the patient (e.g., he continued to avoid looking at the visual stimuli, despite repeated instructions to attend to them). The data of another 6 were discarded because the patient responded insufficiently to meet the Output Index criterion.

The phallometric data of the remaining 190 patients were examined in a series of linear regression analyses. A separate analysis was carried out for each of the three sex-preference indices, which served as the criterion variables. All analyses used the same four predictor variables—namely, the patient's number of older brothers, older sisters, younger brothers, and younger sisters. The predictors were entered directly into the regression equation. The results (specifically, the standardized β coefficients and their associated significance levels) are shown in Table I.

A positive β coefficient in Table I means that a greater number of siblings (of a particular type) was associated with a higher (more homosexual) score on the corresponding sex-preference index. Number of older brothers correlated with the Pedophilic Sex-Preference Index and, to a lesser degree but still significantly, with the Teleiophilic Sex-Preference Index. The correlation between number of older brothers and the Hebephilic Sex-Preference Index was in the same direction, but this correlation did not reach the .05 level of statistical significance. None of the other three types of siblings correlated significantly with any of the sex-preference indices. These results indicate that the more older brothers a pedophile has, the greater his sexual interest in boys compared with girls.

Two additional linear regression analyses were conducted, both using the Pedophilic Sex-Preference Index as the criterion variable. The first of these added the age of the patient's mother at the time of the patient's birth as a fifth predictor variable; the second added the age of the patient's father instead. The patients in the first analysis were those 175 who knew their mother's age, and those in the second were the 165 who knew their father's age. The results did not change any of the conclusions. The number of older brothers, and only the number of older brothers, was significant in both analyses. Neither maternal nor paternal age correlated with the relative preference for male vs female children ($\beta = .01$,

$p = .90$, and $\beta = .08$, $p = .33$, respectively). These results demonstrate that the observed fraternal birth order effect was not really an artifact of parental age.

The linear regression analyses of phallometric data were a sensitive means for showing that sexual orientation correlates with number of older brothers among pedophiles as it does among teleiophiles. These analyses did not, however, show whether homosexual pedophiles (conceived as a discrete group) have more older brothers than men in the general population, or where heterosexual and bisexual pedophiles stand in this regard. Another analysis was therefore carried out, using the already-mentioned gynephilic control group.

In this analysis, the full group of 260 Toronto and Campbellford pedophiles were divided into three groups according to their offense histories or self-reported erotic preferences: 152 heterosexual pedophiles (men with offenses or self-reported attractions involving girls only), 43 bisexual pedophiles (boys and girls), and 65 homosexual pedophiles (boys only). These were matched with an equal number of gynephilic controls, bringing the total number of subjects in this analysis to 520.

The gynephilic controls were matched to the pedophilic patients on two variables. The first of these was the subject's year of birth. This variable was used because demographic trends during the years when a sample of randomly selected subjects were born can have a significant effect on that sample's expected birth order (Hare and Price, 1969, 1974; Price and Hare, 1969). The second variable was the subject's total number of siblings other than older brothers—that is, older sisters plus younger brothers plus younger sisters. This variable was used as a means of controlling for family size while allowing the subject's number of older brothers to vary between groups. The decision to add these three classes of siblings together was justified by the findings of the linear regression analyses that none of them correlated with sexual orientation, once number of older brothers was taken into account.

The 260 controls were randomly selected from the pool of 663 gynephilic volunteers so as to match the joint distribution of pedophilic patients by year of birth and number of siblings other than older brothers. This was effected as follows: The combined group of pedophilic patients was divided into quartiles according to year of birth. These quartiles were cross-tabulated with the subject's total number of siblings other than older brothers. The same procedure was carried out on the pool of gynephilic volunteers. From each cell in the volunteers' table, a sample of controls, equal in size to the number of patients in the corresponding cell in the patients' table, was selected. This is most easily understood by example: There were 13 patients and 29 gynephilic volunteers who were born between 1952 and 1962, and who had a total of 3 siblings other than older brothers. A computer program therefore randomly selected 13 of the 29 volunteers for the control group. When the number of available volunteers in a cell was smaller than the number of patients, adjacent cells in the volunteers' table were combined.

The control group selected by this procedure was closely similar to the combined group of pedophiles on the two relevant variables. The mean year of birth for

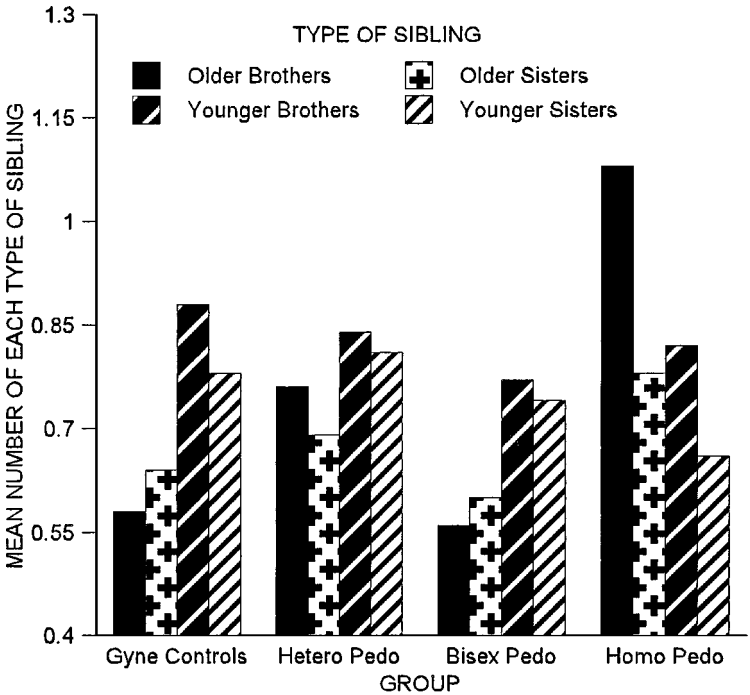

Fig. 1. The mean number of siblings of each type reported by each group. "Gyne Controls," gynephilic controls; "Hetero Pedo," heterosexual pedophiles; "Bisex Pedo," bisexual pedophiles; "Homo Pedo," homosexual pedophiles.

the controls was 1960.73 ($SD = 13.84$) and that for the pedophiles was 1961.57 ($SD = 14.26$). The controls' mean number of siblings other than older brothers was 2.29 ($SD = 1.98$), and that of the patients was 2.28 ($SD = 1.99$).

Figure 1 shows the mean numbers of older brothers, older sisters, younger brothers, and younger sisters for each of the four groups. One would expect, both from the results of the regression analyses and from the fact that these variables were used in selecting the matched controls, that there would be no differences between groups in mean numbers of older sisters, younger brothers, or younger sisters. This was confirmed by one-way ANOVAs (all Fs < 0.40). In contrast, a one-way ANOVA for number of older brothers, the "unconstrained" variable, revealed the presence of significant between-groups differences ($F(3, 516) = 4.20$, $p = .006$). A set of Dunnett tests, which compared each of the three pedophilic groups with the gynephilic control group, showed that the homosexual pedophiles had more older brothers than the controls ($p = .002$), but the heterosexual and bisexual pedophiles did not ($p = .29$, and $p = .99$, respectively). These results confirm the finding of the regression analyses that fraternal birth order correlates with sexual

orientation in pedophiles; they further suggest that fraternal birth order does not correlate with pedophilia per se.

A final series of analyses investigated whether the sibships of any of the groups contained an unusual excess of males or females. The variable, *sibling sex ratio,* is commonly reported as the ratio of brothers to sisters collectively reported by a given group of subjects (who are usually referred to as the *probands* in this type of research). In White populations, the ratio of male live births to female live births is close to 106 males per 100 females (Chahnazarian, 1988; James, 1987). In the computation of inferential statistics, this value is more conveniently expressed as the proportion of males rather than the ratio of males to females, that is, .515 (106/206). For reasons pertaining to the existence of slight between-couples variability in the probability of producing male offspring, an adjusted value of .518 has been suggested for use when a sample of probands consists entirely of males (James, 1998).

In this study, the gynephilic controls had 380 brothers and 368 sisters, for a sibling sex ratio of 103 (and a proportion of .508); the heterosexual pedophiles had 243 brothers and 228 sisters, for a sibling sex ratio of 107 (.516); the bisexual pedophiles had 57 brothers and 58 sisters, for a sibling sex ratio of 98 (.496); and the homosexual pedophiles had 123 brothers and 94 sisters, for a sibling sex ratio of 131 (.567). These data were compared with the adjusted population value (.518) using the z approximation to the binomial test. The sibling sex ratios of the first three groups showed no evidence of a greater than expected proportion of brothers (all p values $> .30$, one-tailed). The sibling sex ratio of the homosexual pedophiles, however, did approach statistical significance ($p = .08$, one-tailed). This result is probably not redundant with the finding of a high fraternal birth order for this group, because the sex ratio was high for siblings born after the proband (123) and for those born before the proband (137).

DISCUSSION

Implications for Sexual Orientation

The results show that pedophiles with more older brothers have more sexual interest in boys relative to their sexual interest in girls. These results confirm the prior finding that sexual orientation correlates with fraternal birth order in pedophiles (Bogaert *et al.*, 1997) and thus establish that this correlation extends beyond men who prefer physically mature partners (teleiophiles).

The present study did not address the specific mechanism linking older brothers and homosexuality. The authors have previously speculated that the proximate cause is maternal antibodies to Y-linked minor histocompatibility antigens (H-Y antigens), which are raised in increasing concentrations by each succeeding male fetus, and which have increasingly stronger effects on sexual differentiation in the

brain in each succeeding male fetus (Blanchard and Bogaert, 1996b; Blanchard and Klassen, 1997). This hypothesis is consistent with a variety of evidence, including the apparent irrelevance of older sisters to the sexual orientation of later-born males, the absence of any correlation between birth order and sexual orientation in females, the probable involvement of H-Y antigen in the development of sex-typical traits, and the detrimental effects of immunization of female mice to H-Y antigen on the reproductive performance of subsequent male offspring (Blanchard, 1997; Blanchard and Klassen, 1997).

There are, of course, other possible explanations of the fraternal birth order effect besides the maternal immune hypothesis (e.g., Bem, 1996; Sulloway, 1996, pp. 433–434, 488). A variety of these has been reviewed elsewhere (Blanchard, 1997). The most popular rival hypothesis is the notion that sexual interaction with older males increases a boy's probability of developing a homosexual orientation, and that a boy's chances of engaging in such interactions increase in proportion to his number of older brothers (e.g., Jones and Blanchard, 1998). Although this hypothesis may seem intuitively plausible, there are little empirical data to recommend it (see discussion in Purcell *et al.*, in press).

Implications for Pedophilia

The proportion of pedophiles in this study who were exclusively or primarily interested in boys, as assessed from their offense histories, was 25%. This result is consistent with previous studies that suggest the prevalence of homosexuality is about 10 times higher in pedophiles than in teleiophiles (Blanchard *et al.*, 1999; Gebhard *et al.*, 1965; Mohr *et al.*, 1964). As previously noted, one explanation of this discrepancy is that the factors that determine sexual preference in pedophiles are different from those that determine sexual preference in teleiophiles (Freund *et al.*, 1984). The finding that fraternal birth order correlates with sexual preference in both groups shows that this explanation is incorrect or, at best, incomplete.

An alternative explanation for the high prevalence of homosexuality in pedophiles is the following: Pedophilia and homosexuality tend to occur in the same men because these individuals are generally less resistant to factors that divert psychosexual development from the species-typical outcome of sexual interest in receptive, physically mature females. This hypothesis is consistent with evidence that other sexually variant behaviors, for example, exhibitionism, are also common in pedophiles (Paitich *et al.*, 1977; Raymond *et al.*, 1999; Rooth, 1973). This hypothesis proposes that the clustering of sexual variations results from the absence of a single protective factor, rather than the presence of multiple pathogenic factors, or a single pathogenic factor with multiple effects. The missing protective factor could be analogous to, or an aspect of, the biological phenomenon known as *canalization*—that is, the tendency for feedback loops to return a developing system to its usual pathway, when that system has been diverted to a minor extent

from it (e.g., Waddington, 1962). As used by biologists, this term includes mechanisms that stabilize development against disruptive environmental influences and those that buffer development against genetic-mutational loss of function (Wilkins, 1997). Of particular relevance to the present discussion is the finding that there are individual differences in efficiency of canalization, with some persons being more prone to multiple developmental disruptions than others (Bogle *et al.*, 1994; Cronk and Reed, 1981; Prader *et al.*, 1963; Rose *et al.*, 1987; Shapiro, 1975).

The hypothesis that the failure of some protective (or corrective) mechanism might account for the emergence of multiple paraphilias has previously been advanced in other contexts. For example, the clustering of fetishism, transvestism, and autogynephilia (sexual arousal in association with thoughts of having a woman's body) has been attributed to "the failure of some developmental process that, in normal males, keeps heterosexual learning 'on track'" (Blanchard, 1991, p. 247). In the present case, the correlation of pedophilia and mental retardation (Blanchard *et al.*, 1999) suggests that the hypothesized failure of canalization may sometimes be part of a larger picture of neurological dysfunction.

The canalization-failure hypothesis—or any similar hypothesis that focuses on the susceptibility of the individual—can explain why the prevalence of homosexuality is higher in pedophiles than in teleiophiles, even if the factors that influence sexual orientation in the two groups are identical in nature and in objective magnitude. This hypothesis changes the original question from, "Why is the prevalence of homosexuality so high in pedophiles?" to "Why do the same individuals tend to become both homosexual and pedophilic?" The greatest drawback of the hypothesis is its silence regarding the difference in cross-gender behavior between boys who will later be homosexual pedophiles and those who will later be attracted to adult men—a difference that was handily explained by the hypothesis that homosexuality has different etiologies in pedophiles and teleiophiles (Freund *et al.*, 1984). This issue may prove a fatal flaw in the canalization-failure hypothesis, leading to its eventual rejection, or merely a temporary lack that is filled by subsequent theoretical elaboration.

Implications for Gender Identity Disorder

The topic of cross-gender behavior is also raised by one of this study's secondary findings. Several studies of homosexual men, including some of the largest studies of homosexuality ever conducted, have found that homosexual men have higher than expected sibling sex ratios. This research has been reviewed in detail elsewhere (Blanchard, 1997). In the authors' experience, homosexual groups who have a sibling sex ratio that is significantly higher than the expected value of 106 always have an excess of younger brothers as well as an excess of older brothers, although the excess of younger brothers is considerably smaller (Blanchard, 1997). This suggests that a high sibling sex ratio is not merely an alternative view of a

high fraternal birth order, but perhaps a separate phenomenon requiring its own explanation (Blanchard, 1997).

An early review of the evidence (Blanchard *et al.*, 1995) suggested that high sibling sex ratios are specific to extremely feminine homosexual male groups (e.g., transsexuals). Several studies in the succeeding years seemed to confirm that hypothesis (Blanchard, 1997). The latest evidence, however, casts doubt on it. One recent study found a high sibling sex ratio in a sample of predominantly African-American homosexual men, who were not recruited with regard to their gender role behavior, and who may or may not have been notably feminine (Bogaert, 1998). That result is consistent with the present finding of a sibling sex ratio of 131 for homosexual pedophiles (who, as already explained, are not feminine). That value was not statistically significant given the sample size ($N = 217$ siblings), but it is quite high in absolute terms. Moreover, the sibling sex ratio was high for the subjects' younger siblings and for their older siblings. The present study, therefore, also suggests that the hypothesis of Blanchard *et al.* (1995) was incorrect.

Implications for Societal Attitudes

A few closing comments are necessary to preclude any misunderstanding or misuse of this study. First, the statistical association of homosexuality and pedophilia concerns developmental events *in utero* or in early childhood. Ordinary (teleiophilic) homosexual men are no more likely to molest boys than ordinary (teleiophilic) heterosexual men are to molest girls. Second, the causes of homosexuality are irrelevant to whether it should be considered a psychopathology. That question has already been decided in the negative, on the grounds that homosexuality does not inherently cause distress to the individual or any disability in functioning as a productive member of society (Friedman, 1988; Spitzer, 1981).

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